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ABSTRACT

In the West, science is assumed to be an integral part of Western culture. What interests Western educators and policy makers is achievement in science, particularly the comparative achievement in science among students of different Western nations plus Japan. Americans are constantly asking whether or not our students know as much science as Japanese and German students, for example. While educators in non-Western, developing nations share an interest in achievement, they ask other questions that rarely arise in the West, more fundamental questions about world view and the compatibility of various non-Western world views with modern science. There is also the question of what influences Western scientific thought has on traditional thought, and whether those influences are always advantageous. Several scholars from Yemen, Nigeria, Lesotho, Botswana, and the United States have formed a cooperative team to examine some of these issues. Three points addressed by the research are: (1) the fallible and subjective nature of science; (2) learning as a constructive process; and (3) cultural features shared by the United States and developing countries. (MDH)

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A COOPERATIVE RESEARCH GROUP FOR THE STUDY OF CULTURE AND SCIENCE EDUCATION IN DEVELOPING COUNTRIES

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Paper presentation at the UNESCO international conference on science education in developing countries, Jerusalem, January 3-8, 1993.

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ABSTRACT

In the West, science is assumed to be an integral part of Western culture. In theory, science is not alien to people of Western culture. What interests Western educators and policy makers is achievement in science, particularly the comparative achievement in science among students of different Western nations plus Japan. Americans are constantly asking whether or not our students know as much science as Japanese and German students, for example. While educators in non-Western, developing nations share an interest in achievement, there are other questions that rarely arise in the West, more fundamental questions about one's understanding of and relationship with the natural world, and understanding of causality. These are questions about world view and the compatibility of various non-Western world views with modern science. Moreover, there is the question of what influences Western scientific thought has on traditional thought, and whether those influences are always advantageous. Several scholars from Yemen, Nigeria, Lesotho, Botswana, and the United States has formed a cooperative team to examine some of these issues.

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I have defined 3 points on which to both rest and inform the research we are promoting.

1. The fallible and subjective nature of science.
   Though by no means advocating a radical relativist position, it seems to me that in recent years the philosophical and social studies of science have rendered untenable the strict objectivism and classical realism of positivist thought.

2. Learning as a constructive process.
   The above mentioned new philosophical and social insights into the nature of science support a constructivist understanding of learning, i.e., learning is an interpretive process, greatly influenced by prior learning and experience, in which knowledge is constructed by the learner, not simply received.

3. The USA and developing countries share important cultural features.
   The USA is clearly an industrially, technologically, and scientifically advanced nation. It is a highly developed modern state - a status it shares with other nations of the West. However, despite its industrially, technologically, and scientifically advanced state, the USA bears a significant <u>cultural</u> resemblance with most developing nations of the Third World.

Let me begin my discussion with this last point - a point which is sure to have raised a few eyebrows. My research area is culture as a factor in science education. The single most influential factor in taking up this line of inquiry was the time (4 years to be exact) that I spent as a science education lecturer in Sokoto, Nigeria. What caught my attention in Africa was not so much that culture and tradition conflicted with science, but that the science I saw being taught was far from the objectivist ideal of cultural neutrality. I saw that science education carried with it a cultural context, and I could not help but wonder where the source of science/culture conflict really lay? Was it a matter of science vs culture? Or, was it a matter of science <u>context</u> vs culture? Moreover, as I thought about science education problems in the USA, I could not help but again wonder what the real problems were and whether an important issue of culture had been overlooked.

America is a Western culture meaning that its cultural roots are European. America is also quite distinct. It is an ethnically diverse country whose culture has been influenced by immigrants from round the globe to an extent far greater than any other Western nation. But I think of greater importance, American culture is not nearly as secular as Western culture on the whole. American culture, largely because of the strong presence of traditional religious thought, is quite traditional. Science in contrast is typically couched in a modernist philosophy of secular materialism. So the issues that confront scientific literacy in Nigeria, for example, are not quite so different as usually assumed.

Constructivist Research

Turning now to the first points. These points signal a constructivist approach to science and science education rather than a positivist approach. Constructivist and positivist thought deal with culture in very different ways. In positivism, science is above culture. The only concern of science with culture is that culture not hinder science. For the positivist, whether in a developing country of or the USA, the first objective of science education is the elimination of all traditional thought that is deemed a hindrance to science, and of course, to replace that traditional thought with scientific thought. In other words, positivistic science is quite imperialistic.

Now while constructivists differ on this point, in the main they agree that science is not something that sits separated from, let alone above, culture. In other words, science always exists in a context. In a sense, science is always embedded in culture, one or another. Science content is science content regardless of culture to be sure, but not so with its communication nor the policies that support science. Communicated science, science policy, and science education are inculturated. In the jargon of education, there is always a hidden curriculum. In my opinion, this raises three issues. The first is the matter of traditional culture and its potentially adverse influence on science education. This is a frequently cited concern in the literature. The second and third issues have received much less attention. The second issue is the potentially adverse influence of an alien hidden curriculum on the integrity of a traditional culture. The third issue concerns the alien hidden curriculum and its potentially adverse influence on science education. We understand that culture changes. Any new idea brings change as people in the host environment react and adapt to the new idea. Modern science will influence a non-Western culture as surely as it has influenced Western culture. Our concerns are not about cultural change per se, but about unwarranted change. Must African nations, for example, adapt to science and adapt science to African culture exactly as the West has done? This concern arises because, relatively speaking, modern science and science education are newly imported phenomenon in the cultures of most developing countries. And, science is indeed a powerful cultural force.

Traditionally, the study of culture is left to the cultural anthropologists. However, in recent years scientists, historians, and literary critics, among others, have undertaken cultural studies. What unifies these eclectic cultural scholars is that they take a subject whose working assumptions are considered natural and attempt to demonstrate that they are culture-bound. Cultural studies in science education have turned implicit assumptions into explicit research questions:

1. What do students and teachers believe about the world around them, especially the physical world?

2. How do students and teachers understand their own place in the world, especially their relationship to the physical world?

3. What is the cultural milieu in which these student and teacher beliefs, values, and relationships are grounded and supported?

4. What is the culture of science and how is that culture interpreted in the school science classroom?

5. What happens when student cultures, teacher culture, and the culture of science meet face to face in the classroom?

6. When science is resisted, is it the science people object to or is it the context of the science?

7. When pupils are influenced by science education, are they influenced solely by science? Or, are they influenced by science plus the context in which it is presented?

In other words, it is important for science educators to understand the fundamental, culturally based beliefs about the world that students bring to class, and how these beliefs are supported by students' cultures; because, science education is successful only to the extent that science can find a niche in the cognitive and socio-cultural milieu of students. These are questions that never occur in positivism.

There are many specific research questions that can be derived from these questions. What I proposed along with my colleagues in Nigeria, Botswana, Lesotho, and Yemen is an exploratory study.

First: we want to sit as a group and ask how might science education look in different cultural situations so that it would reflect proper science but in a culturally acceptable context? We have invited several papers:

Masakata Ogawa-	Western science and non-Western culture
Meshach Ogunniyi-	Summary of Ogunniyi's research on African world views
Duro Ajeyalemi-	Impact of Western thought on Nigerian culture
Femi Oladele-	Yoruba culture and science.
Gerhard Mathot-	Cultural issues in Lesotho
Abdullateef Haidar-	Arabic culture and science education
Wm. Cobern-	Constructivism and science education research

Second: We want to explore the appropriateness of logico-structural theory of world view for research pertaining to cultural issues and science education in non-Western, developing

nations. Logico-structuralism is a theory from cultural anthropology that posits world view as a composite of seven universally-found categories: Self, NonSelf, Classification, Relationship, Causality, Time, and Space. Each category is composed of logically related presuppositions. The power of logico-structuralism lies in this composite structure. The seven categories alert the researcher to the complexity of world view while simultaneously providing access to that complexity. Yet one can still characterize world views by focusing on what are consdered the salient presuppositions within the seven universal categories.

Third: Explore the appropriateness of interpretive research methodologies, in particular an interview series I developed based on logico-structural theory of world view.